

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Christopher L. Boyd, *et al.*
Serial No.: 14/355,533
Filed: 30 April 2014
For: Appliance Immersion Cooling
System

31 January 2017

Art Unit: 3744
Examiner: D. Russell

Amendment

HONORABLE COMMISSIONER OF PATENTS AND TRADEMARKS,

SIR:

In the Office Action mailed 4 November 2016 (Office Action), the Examiner rejected claims 1-10 in the subject Application. In response, Applicants submit the following amendments and remarks:



Claims

1. (Presently amended) An appliance immersion cooling system comprising:
 - a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:
 - a weir, integrated horizontally into the long wall of the tank adjacent all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot;
 - a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:
 - a plenum, positioned adjacent the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot;
 - a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and
 - a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.
2. (Presently amended) The system of claim 1 wherein the tank and primary circulation facility comprise a ~~tightly co-located~~ highly-integrated module.
3. (Original) The system of claim 1 wherein the tank further comprises:
 - an interconnect panel facility adapted to mount appliance support equipment.

4. (Original) The system of claim 1 wherein the primary circulation facility further comprises:

at least first and second primary circulation sub-facilities, each adapted to operate independently to circulate the dielectric fluid through the tank;

wherein the control facility is further adapted to coordinate the operation of the first and second primary circulation sub-facilities and the secondary fluid circulation facilities so to maintain the temperature of the dielectric fluid in the tank substantially between a predetermined minimum temperature and a predetermined maximum temperature.

5. (Original) The system of claim 1 wherein the control facility further comprises a communication facility adapted to facilitate monitoring and control of the control facility from a remote location.

6. (Presently amended) A tank module adapted for use in an appliance immersion cooling system, the tank module comprising:

- a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

- a weir, integrated horizontally into the long wall of the tank adjacent all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot;

- a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:

- a plenum, positioned adjacent the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot;
 - and

- a control facility adapted to control the operation of the primary fluid circulation facility as a function of the temperature of the dielectric fluid in the tank.

7. (Presently amended) The module of claim 6 wherein the tank and primary circulation facility comprise a ~~tightly co-located~~ highly-integrated module.

8. (Original) The module of claim 6 wherein the tank further comprises:

- an interconnect panel facility adapted to mount appliance support equipment.

9. (Original) The module of claim 6 wherein the primary circulation facility further comprises:

- at least first and second primary circulation sub-facilities, each adapted to operate independently to circulate the dielectric fluid through the tank;

wherein the control facility is further adapted to coordinate the operation of the first and second primary circulation sub-facilities so to maintain the temperature of the dielectric fluid in the tank substantially between a predetermined minimum temperature and a predetermined maximum temperature.

10. (Original) The module of claim 6 wherein the control facility further comprises a communication facility adapted to facilitate monitoring and control of the control facility from a remote location.

Remarks

1. In the Office Action, the Examiner rejected claims 2 and 7 under 35 USC 112(b) as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventors regard as their invention. In particular, the Examiner has asserted that the term "tightly co-located" is not sufficiently understood, or specifically defined by the specification, for its metes and bounds to be definite. As explained in paragraph [0044], the Applicants intend the term "tightly co-located" to characterize the essential components of the primary circulation facility 28 as being physically located sufficiently close to the tank 14 "so as to form a highly-integrated module", see, lines 6-8. As noted in lines 3-6, the principle purpose in so arranging these components is to "move the secondary fluid to the point of heat exchange with the primary fluid, rather than to move the primary fluid to the point of exchange with the secondary fluid." As noted, "[i]n addition to conserving valuable floor space in a typical data center installation, the resulting modular configuration facilitates both easy initial installation and subsequent upgrade to efficiently satisfy increasing data center workloads", see, lines 14-17. In view of these details and the example configuration set forth in the drawings, Applicants respectfully submit that the term "tightly co-located" *is* sufficiently well defined to satisfy the requirements of 35 USC §112(b). Notwithstanding, in an effort to reduce issues, Applicants have amended claims 2 and 7 to replace the term "tightly co-located" with the term "highly-integrated", an alternative term used in the specification to describe this physical arrangement.

2. In the Office Action, the Examiner has rejected 1-10 under 35 USC §102(b) as anticipated by US Application Serial No. 2011/0132579, Best, *et al.* ("Best"). In section 5 of the Office Action, the Examiner has suggested that, in Best, the "common manifold area" defined between the tops of the devices and the surface of the fluid corresponds to Applicants' "weir"; and that the "common manifold area" defined between the bottoms of the devices and the bottom of the tank corresponds to Applicants' "plenum". However, neither of these "pseudo-structures" is present when the tank is empty of fluid; whereas both of these physical structures are required by Applicants' apparatus claims 1 and 6, even in the absence of fluid.

Perhaps recognizing that this §102(b) position is not as strong as might be desired, the Examiner has, in the alternative, rejected claims 1-10 under 35 USC 1§03(a) as being obvious over Best in view of US Application Serial No. 2006/0126292, Pfannl, *et al.* ("Pfannl"). In this rejection, the Examiner has suggested that, in Pfannl, the openings 122 into the outlet plenum 112, collectively, perform substantially the same function as Applicants' weir. However, Applicants respectfully note that, in both claim 1 and claim 6, the weir is defined as being "integrated horizontally into the long wall of the tank adjacent all appliance slots, [and] adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot". In contrast, in Pfannl, each of the openings 122 into the plenum 112 is disposed adjacent only to a respective single ONE of the appliance slots, and none is disposed adjacent to ALL of the appliance slots. Further, the rate of air flow through each of the openings 122 into the plenum 112 is NOT substantially uniform since the outlet port 112a itself does not lie adjacent to each of the openings 122. It follows, therefore, that the function performed by the set of openings 122 into the plenum 112 is **not** equivalent to the function performed by Applicants' weir.

In an effort to further distinguish Applicants' weir from the plenum structure in Pfannl, Applicants have amended claims 1 and 6 to emphasize that it is the "overflow lip" of the weir that is "adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot". Support for this amendment can be found in paragraph [0029].

3. Applicants respectfully submit that claims 1-10, as amended herein, patentably distinguish over the prior art of record. Accordingly, Applicants request reconsider of the claims, as amended herein, and allowance thereof.

Respectfully submitted,
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1	Applicant Arguments/Remarks Made in an Amendment	JMG001_a1_170131.pdf	88486	no	7
			001d7c1fcb32be57d664d6d110518f89e7d f96bc		

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APPLICATION AS FILED – PART I												
(Column 1)			(Column 2)									
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)				
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A						
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TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =		*		X \$ =						
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<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).										
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))												
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APPLICATION AS AMENDED – PART II												
(Column 1)			(Column 2)			(Column 3)						
AMENDMENT	01/31/2017		CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))		* 10		Minus	** 20	= 0		X \$40 =		0	
	Independent (37 CFR 1.16(h))		* 2		Minus	***3	= 0		X \$210 =		0	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))											
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))											
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(Column 1)			(Column 2)			(Column 3)						
AMENDMENT			CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))		*		Minus	**	=		X \$ =			
	Independent (37 CFR 1.16(h))		*		Minus	***	=		X \$ =			
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))											
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))											
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